Exhibit A

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Mr. Lee Browne,
Greenwich Technologies
2 Soundview Drive
Greenwich, CT 06830

April 20, 1992

Dear Mr. Browne,

Enclosed please find a summary technical evaluation of your patent document entitled "Audio and Video Transmission and Receiving System". This report provides a summary of Sarnoff's evaluation of the video-on-demand system outlined in the Greenwich document, and is accompanied by a reference list and copies of selected papers.

The attached report represents the final deliverable responsive to the Sarnoff/Greenwich technical services agreement dated 3/6/92. Note that the scope of our evaluation was limited to technical issues, including identification of promising technology areas for further development. Business considerations and strategic planning mentioned in your letter of 3/13 are beyond the scope of my activity; please talk to Jeff Wojnar and/or Len Schiff if you wish to pursue these topics further.

If there are any questions re: the technical evaluation, please feel free to call me at (609) 734-2311. It has been a pleasure working with you and Susan. Best regards.

Sincerely,

D. Raychaudhuri

(D. Raychaudhuri)
Head, Broadband Communications Research

cc: L. Schiff
J. Wojnar
N. Wilson
S. Hinrichs (Greenwich)

Brief Technical Review of:

Audio and Video Transmission and Receiving System

Prepared for:
Greenwich Technologies, Inc.

Prepared by:
Communications Research Laboratory
David Sarnoff Research Center
Princeton, NJ 88543-5300.

April 17, 1992

Scope:

This is a summary report of Sarnoff's technical review of the video-on-demand patent document entitled "Audio and Video Transmission and Receiving System" by Yurt and Browne. As discussed at the 3/12/92 meeting, our review of the material provided by Greenwich Technologies is at a general technical level, and is not intended as an expert evaluation of patentability. Rather, we have focused on the novelty and technical validity of the proposed system in the context of published material on this subject, and have then tried to identify promising areas for possible further development.

Summary:

The patent document supplied by Greenwich Technologies outlines a generic set of technologies necessary for a video-on-demand system. The general principles of the system described in the patent are believed to be technically correct, though significant additional design detail will have to be developed before a proof-of-concept prototype can be implemented. Based on our review of published material (see references) in the area of video-on-demand, interactive multimedia, etc., we do not consider the overall system architecture to be novel in a scientific/technological sense. Similar concepts for storing, accessing, transmitting and displaying compressed video and audio information are widely understood by researchers in the telecommunication and multimedia fields. In some cases, these concepts have also been demonstrated in practice, such as the video-on-demand prototype currently being shown at Bell Communications Research, Morristown by Dr. A. Gelman [Ref GE 91]. The present document does contain some new material related to the video/audio library and the subscriber receiver, and it is possible that these ideas could be further developed into more detailed patents, working prototypes, or products.

Technical Review:

The patent document entitled "Audio and Video Transmission and Receiving System" by Yurt and Browne outlines a comprehensive architecture for a video-on-demand system. The general goal of a video-on-demand system is to provide remote subscribers with the capability of accessing video/audio material from a large database in a timely and convenient manner. Concepts for such video-on-demand systems have been under discussion in the telecommunication and video delivery industries for the last ·5-10 years. While specific implementations may vary, the key building blocks of a video-on-demand system are: (a) a large digital video/audio library with appropriate logical organization, data compression, rapid access and multiple I/O capabilities; (b) a "head-end" inquiry/response switching system capable of interpreting, packaging and switching subscriber requests for video/audio material; (c) a high-speed transmission system capable of timely and

reliable delivery of digital information to subscribers; and (d) a subscriber receiving and storage unit capable of receiving the requested video/audio, decompressing information where necessary, and presenting the information to the user (with appropriate features such as scheduled delivery, fast forward/reverse, scan, etc.)

The technologies required for implementation of each of these four key system building blocks have only recently become feasible (though cost-effectiveness is yet to be proven). Specifically, recent advances in digital storage (e.g., terabit disk systems) and compression (e.g., MPEG-1 standard compression) now make the concept of a digital image/audio library feasible. At the same time, high-speed switching equipment (e.g., the ANCOR broadband switch) for the head-end is also becoming available, although much work remains before commercial operation is possible. Subscriber equipment necessary for video-on-demand is also likely to become cost-effective over the next 3-5 years, given the expected reduction in cost for storage and decompression VLSI (e.g., MPEG-1 IC's). As digital TV and HDTV technologies evolve, the cost/performance curve for the receiver equipment should improve significantly. The last technology component to complete the picture is switched broadband digital communication, not currently available on most telco or cable facilities. While there have been a few pilot programs (e.g., BellSouth's Heathrow field trials) to demonstrate switched B-ISDN (broadband integrated services digital network), the evolution is likely to be slow in view of the large capital investment required. It is important to note that the feasibility of video-on-demand service depends very strongly on the availability of a cost-effective broadband ISDN (or equivalent) network, an aspect that may have been underestimated in the Greenwich document.

The general principles of the system outlined in the patent document appear to be technically correct, though lacking in specific details particularly at the subsystem level. While the document may serve as a useful starting point for further development, significant additional design / simulation / prototyping work will be required for a meaningful "proof-of-concept". Based on our review of published material on this topic [see reference list & attached papers], we do not consider the overall system architecture to be novel in a scientific/technological sense. Similar concepts for storing, accessing, transmitting and displaying compressed video and audio information are widely understood by researchers in the telecommunication and multimedia fields. In some cases, these concepts have also been demonstrated in practice, such as the MPEG-based video-on-demand / interactive multimedia prototype currently being shown at Bell Communications Research, Morristown by Dr. A. Gelman. Other video-on-demand system architectures (e.g., Bellcore) are considered to be further developed than the Greenwich system since they are associated with more technical detail, particularly in the areas of compression and transmission. The present document

does contain some useful new material related to the architecture and organization of the video/audio library, and it is conceivable that these ideas could be further developed into more detailed subsystem level patents, working prototypes, or products. Such an improved technology position could enhance the commercial value of the present system level technology, and might serve as the basis for future cooperation with other companies in this field.

Further detailed comments about the system description are given below:

Pg. 1-4 The distinctions drawn between this and other previous patents may indeed be valid, and Sarnoff is not supporting or disputing these claims. However, it is remarked here that the concept of delivering video to subscribers with "telephone service" (e.g., Pg. 3) is not feasible since current telephone circuits will require 100's of hours to deliver even a highly compressed (e.g., 1.2 Mbps MPEG video) movie. Also, it appears from page 4, that faster than real-time transmission of video/audio material is envisaged: again, this would require very high-speed (typically fiber-optic) transport, not likely to be available before broadband ISDN is deployed. The concept of providing virtual VCR like features at the receiver is of some interest, but has also been mentioned by others working on this topic.

Pg. 8-10 The description tends to oversimplify the issue of transmission, which must be: (a) high speed, (b) switched; and (c) reliable to support video-on-demand. Many of the media mentioned, e.g., UHF, VHF, telephone, etc. may not be suitable for this demanding application. It is likely that most practical systems for video-on-demand will be based on an all-fiber switched or hybrid switched/broadcast architecture, run either by telcos or CATV operators.

Pg. 12 Copy protection is a complex issue; it is not clear that any current technical approach, including the one mentioned here, is entirely satisfactory.

Pg. 14 The concept of a popularity code may be novel, and could be used for efficient organization of the library.

Pg. 16,19 Video compression is mentioned here only in a generic sense. However, it a key enabling technology that is crucial to the success of video-on-demand in any near- to medium-term. Considerable R&D effort has therefore been invested on this subsystem, which is clearly one of the single most important "value-added" areas for

digital video system development. Bellcore's interactive multimedia prototype uses MPEG-1 standard compression because of the excellent efficiency and availability of VLSI. The Greenwich document is relatively weak in this area.

Pg. 21 The reference to ADPCM for audio is outmoded, and is now replaced by new ISO standards, e.g., MUSICAM, MPEG audio, etc. For both audio and video, a concrete video-on-demand system architecture must identify algorithms and associated bit-rate/performance choices more clearly than has been done here.

Pg. 17 In formatting information into so-called "data blocks", the proposed system architecture does not take into account various existing and emerging standards necessary for operation on broadband networks. Typically, in B-ISDN, data will be formatted into 53 byte ATM (asynchronous transfer mode) cells with appropriate adaptation (AAL) headers, etc. Similarly, timing services will have to be harmonized with available network services, etc. Unless an entire system is custom-built for this application only, the use of non-standard protocols (as implied at various points in the document) may not be appropriate. Also, even if custom protocols are employed, significant additional design information about the data format and protocol layers must be provided before the transmission system described can be considered viable.

Pg. 23-33 The database organization principles outlined here may be of specific value for further development. Some of the details (such as item encoder for address to item mapping, and queue manager program/ dispatch controller for scheduling distribution) could be novel, although Sarnoff is not in a position to support such claims. A working prototype that demonstrates good organization of video/audio material, fast access of a video jukebox, HIPPI interface, etc. may well be of commercial interest. If Greenwich is interested in pursuing this technology area further, the video/audio database is clearly the most promising area for development.

Pg. 34 As stated earlier, video-on-demand is feasible only on a small subset of the delivery media mentioned here, because most conventional media (incl. telephone, cable, DBS, etc.) will not support such traffic, except possibly on a limited experimental basis. Switched fiber-optic B-ISDN, wideband CATV systems, or at least advanced (copper) digital subscriber lines (ADSL) are an essential pre-requisite for the type of applications being considered here.

Pg. 37-43 The receiver described may have one or more novel features (e.g., specific VCR-like capabilities) with potential for development into proprietary technology. Next to the [illegible] the subscriber receiver may be suitable for further design and prototyping work. However, the value of such work will depend on making the design flexible enough to accommodate other system architectures, transport and database [illegible] protocols.

References:

[AL 86] Keith J. Allen, Thomas K. Helstern, "Customer-Controlled Video Switching for Teleconferencing," *IEEE Global Commn. Conf.*, 1986, pp. 907-914.

[BE 86] Jules A. Bellisio and Shuni Chu, "Television Coding for Broadband ISDN," *IEEE Global Commn. Conf.*, 1986, pp. 894-900.

[BO 90] John Bourne, Mark Balmes, Jim Justice, "Heathrow - Experience and Evolution," *IEEE Intl. Conf. on Commn.*, 1990, pp. 1091-1095.

[BU 86] Howard E. Bussey, "Experimental Approaches to Video Services and Technologies," *IEEE Global Commn. Conf.*, 1986, pp. 901-906.

[CO 90] A.R.J. Cook, D.W. Faulkner, P.J. Smith, R.A. Lobbett, "Low-Cost Digital Passive Optical Networks," *IEEE Intl. Conf. on Commn.*, 1990, pp. 659-662.

[EI 90] Daryle J. Eigen "Narrowband and Broadband ISDN CPE Directions," *IEEE Communications Magazine*, 1990, pp. 39-46.

[EN 91] Carl P. Engineer, "Can PON go Broadband?," *Telephony*, January 14, 1991, pp. 30-56.

[FA 89] David W. Faulkner, David B. Payne, Jeffrey R. Stern, John W. Ballance, "Optical Network for Local Loop Applications," *Journal of Lightwave Technology. Vol. 7, No. 11, 1989*, pp. 1741-1751.

[GE 91] A. D. Gelman, H. Kobrinski, L.S. Smoot, S.B. Weinstein, "A Store- And-Forward Architecture for Video-On-Demand Service," *IEEE Intl. Conf. on Commn.*, 1991, pp. 842-846.

[GR 89] Alan F. Graves, "The Heathrow Broadband Access System," *IEEE Global Commn. Conf.*, 1989, pp. 1675-1679.

[HA 86] Barry G. Haskell and Hsueh-Ming Hang, "Comparison of Discrete Cosine Transform and Vector Quantization of Medical Imagery," *SPIE*, Vol. 626 Medicine XIV/PACS IV, 1986, pp. 399-408.

[HI 86] Neale C. Hightower, "Integrated Voice, Data, and Video in the Local Loop," *IEEE Global Commn. Conf.*, 1986, pp. 915-919.

[JU 88] C.N. Judice, "Entertainment Video-On-Demand at T1 Transmission Speeds (1.5 Mb/s)," *SPIE*, Vol. 1001 Visual Communications and Image Processing, 1988, pp. 396-397.

[JU 86] C.N. Judice, E.J. Addeo, M.I. Eiger, H.L. Lemberg, "Video on Demand: A Wideband Service or Myth?," *IEEE Intl. Conf. on Commn.*, 1986, pp. 1735-1739.

[KA 91] Wataru Kameyama, Tsuyoshi Hanamura, Hideyoshi Tominaga, "A Proposal of Multimedia Document Architecture and Video Document Architecture," *IEEE Intl. Conf. on Commn.*, 1991, pp. 511-515.

[KO 88] Takashi Komiya, Yasunobu Suzuki, Hajime Yamada, Keiko Tomita, "An Approach to the Multifunction Graphic Terminal for the ISDN Environment," *IEEE Global Commn. Conf.*, 1988, pp. 32-36.

[KO91] Naoki Kobayashi, Toru Nakagawa, "Multimedia Document Structure for Dialog Communication Service," *IEEE Intl. Conf. on Commn.*, 1991, pp. 526-531.

[LE 86] S. Lederman, "Video-On-Demand - A Traffic Model and GOS Technique," *IEEE Global Commn. Conf.*, 1986, pp. 676-683.

[LI 89] Yih-Kang Maurice Lin, Dan R. Spears, "Passive Optical Subscriber Loops with Multiaccess," *Journal of Lightwave Technology, Vol. 7 No. 11, 1989,* pp. 1769-1777.

[LU 86] C.W. Lundgren, P.S. Natarajan, "Single Mode Fiber Transport and Coaxial Distribution of Video on Demand," *IEEE Global Commn. Conf.*, 1986, pp. 889-893.

[MA 91] Kazutoshi Maeno, Shiro Sakata, Toyoko Ohmori, "Distributed Desktop Conferencing System (MERMAID) Based on Group Communication Architecture," *IEEE Intl. Conf. on Commn.*, 1991, pp. 520-525.

[MC 90] F. Ray McDevitt, Joe Sutherland, "Switched vs Broadcast Video for Fiber-To-The Home Systems," pp. 1109-1119.

[MO 91] Magda M. Mourad, "Object Representation for Multimedia Document Interchange," *IEEE Intl. Conf. on Commn.*, 1991, pp. 532-539.

[MU 90] Kazuo Murano, Koso Murakami, Eisuke Iwabuchi, Toshio Katsuki, Hiroshi Ogasawara, "Technologies Towards Broadband ISDN," *IEEE Communications Magazine*, 1990, pp. 66-70.

[TO 89] Arpad G. Toth, "HDTV and Fiber Optic Communications - An Opinion," *EIA Digital ATV workshop*, 1989, pp. 1-11.

[TO 89] Arpad G. Toth, Joseph Donahue, "ATV Multiport Receiver an overview of the EIA ATV Technical Subcommittee Work," *EIA Digital ATV workshop*, 1989.

[WA 89] Stuart S. Wagner, Ronald C. Menendez, "Evolutionary Architectures and Techniques for Video Distribution on Fiber," *IEEE Communications Magazine*, 1989, pp. 17-25.

[WE 86] Stephen B. Weinstein, "Personalized Services on the Intelligent, Wideband Network," *Zurich Seminar*, 1986, pp. 13-18.